CANDIDATE'S NUMBER

(For the use of the Department only)

Physics 30
Aug. 1968

EDUCATION LIBRARY
UNIVERSITY OF ALBERTA

DEPARTMENT
EDUCATION ALBERTA

HIGH SCHOOL AND UNIVERSITY MATRICULATION
EXAMINATIONS BOARD

DEPARTMENTAL EXAMINATIONS, 1968
AUGUST

PHYSICS 30

Time — 2 hours.

Total Possible Mark — 112.

DO NOT SPEND TOO MUCH TIME ON ANY ONE QUESTION.
READ THE QUESTIONS CAREFULLY.

Mathematical tables, slide rules and geometry sets may be used.

Questions 1 to 39 inclusive, are multiple choice. These will be machine scored. Record your answers on the separate answer sheet provided. Since the questions are not of equal length or difficulty the available time must be budgeted wisely.

Complete solutions must be shown for all remaining problems, questions 40 to 45.

Rough and finished work may be done in either soft pencil or blue or black ink (pen or ballpoint).

DO NOT FOLD THIS BOOKLET.

Place your test booklet in the answer envelope in such a way that the UPPER LEFT HAND CORNER of the BOOKLET (Candidate's Number) shows through the SLASHED CORNER of the answer envelope.

BE SURE TO SEAL THE ENVELOPE.

Constants:

$g = 980$ cm/sec^2 or 32 ft/sec^2
$J = 4.2$ joules/cal or 778 ft lb wt/BTU
1 H.P. = 550 ft lb wt/sec or 746 watts
Latent Heat of Fusion of ice is 80 cal/gm or 144 BTU/lb
Specific Heat of ice is 0.5
Latent Heat Vaporization of water is 540 cal/gm
Wt of one cubic ft water is 62.4 lb wt
1 Faraday of charge = 96,500 coulombs

Machine Score
Booklet Score
TOTAL

(For the use of Sub-examiners only)

LB
3054
C2
D419
1968a
phy.30

CURR HIST

FOR ROUGH WORK ONLY

(No marks given for work in this space)

Ex libris
Universitatis
Albertaensis

QUAECUMQUE VERA

The first 39 questions are short answer questions worth 2 marks each. In each case select the BEST of the four answers and record your choice on the separate answer sheet provided.

EXAMPLE	ANSWERS	ANSWER SHEET
If an object has a speed of 4 ft/sec how far will it travel in 2 seconds.	A. 4 ft B. 8 ft. C. 6 ft D. 10 ft	A ☐ B ■ C ☐ D ☐ E ☐ DISREGARD COLUMN "E" ON THE ANSWER SHEET

You are to use an ORDINARY HB PENCIL to mark your answers on the answer sheet. Make certain your answer marks are heavy and black. If you change your mind about a question it is essential that you erase your first mark completely. There should be only one answer marked for each question. Be sure there are no stray pencil marks on your answer sheet.

1. A force of 4 lb and another of 7 lb wt act on a point. If the forces are perpendicular to each other, the magnitude of the resultant to the nearest whole number is

1. A. 8 lb wt
B. 9 lb wt
C. 10 lb wt
D. 11 lb wt

2. A boy is riding a ferris wheel which is rotating at a uniform rate. Which one of the following is NOT constant?

2. A. acceleration
B. kinetic energy
C. speed
D. velocity

3. One pendulum has the same length as another but the weight of the bob in the second pendulum is twice as great as that of the first. The time required by the second pendulum to complete an oscillation compared with the time required by the first will be

3. A. half
B. equal
C. twice
D. four times

4. A ball is rolling down an inclined plane with an acceleration of 7½ ft/sec^2. What distance does it travel during the time that its velocity increases from 10 ft/sec to 20 ft/sec?

4. A. 5 ft
B. 10 ft
C. 20 ft
D. 40 ft

5. In the apparatus for the Fletcher's trolley experiment screws are provided for changing the level of one of the board on which the trolley runs. The purpose of adjusting these screws is to

5. A. make the trolley level
B. neutralize the effect of friction
C. make the trolley run in a straight line
D. change the frequency of the vibrating spring

6. A car of 4000 lb mass is travelling at 60 mph. Brakes are applied which give a retarding force of 500 lb wt to the progress of the car. How many seconds will it take to stop the car?

6. A. 22
B. 33
C. 44
D. 55

FOR ROUGH WORK ONLY

(No marks given for work in this space)

LIBRARY
UNIVERSITY OF ALBERTA

7. If a car travelling 45 mph can be brought to a stop in 10 seconds, how many feet will it travel before it stops?

7.
A. 220
B. 330
C. 440
D. 660

8. A man is standing on a scale in an elevator which is ascending with an acceleration of 8 ft/sec^2. If the man weighs 160 lb wt what will the scale read while the elevator is accelerating?

8.
A. 120 lb wt
B. 160 lb wt
C. 200 lb wt
D. 240 lb wt

9. Power can be determined by dividing one of the following by time

9.
A. momentum
B. work
C. velocity
D. acceleration

10. A plank is raised so that one end is 5 ft above the horizontal. A man weighing 176 lb wt walks up the plank. The number of ft lb wt of work he does is

10.
A. 880
B. 1320
C. 1760
D. 2650

11. The ratio of the work output of a machine to that of the work input is called

11.
A. force ratio
B. velocity ratio
C. power
D. efficiency

12. The simple machine basic to the screw is the

12.
A. pulley
B. inclined plane
C. lever
D. wheel and axle

13. A guy wire is fastened to the top of a pole. The wire makes an angle of 60 degrees with the ground. If the tension in the guy wire must be sufficient to produce a horizontal force of 60 lb wt at the top of the pole, what tension in lb wt is required in guy wire?

13.
A. 30
B. 60
C. 72
D. 120

14. A cylindrical bar is 8 ft long and has a uniform diameter. One 4 ft length is made of material whose specific gravity is three times that of the other 4 ft length bar. How far from the heavy end of the bar is its center of gravity?

14.
A. 1 ft
B. 2 ft
C. 3 ft
D. 4 ft

15. A tank 10 ft long, 5 ft wide and 4 ft deep is full of water. What is the total thrust on one end of the tank?

15.
A. 2496 lb wt
B. 3120 lb wt
C. 4892 lb wt
D. 6240 lb wt

FOR ROUGH WORK ONLY

(No marks given for work in this space)

16. 10 cc of wax (S.G. of wax is 0.8) is attached to 10 cc of aluminum (S.G. of aluminum is 2.7). What force would be required to prevent the combined objects sinking in fresh water?

16.
A. 8 gm wt
B. 15 gm wt
C. 20 gm wt
D. 27 gm wt

17. A thermometer places the freezing point of water at 100° and the boling point at 500°. What approximate reading on this thermometer corresponds to 0° F?

17.
A. 100°
B. 71°
C. 29°
D. 40°

18. A metal tape 100 ft long is used to measure 100 yds along one side of a field when the temperature was 0° F. The same tape was used to measure the other side of the field the next day when the temperature was 45° F. The coefficient of linear expansion of the tape is 0.000018/° C. The difference between the two measurements made is

18.
A. 0.09 ft
B. 0.135 ft
C. 0.24 ft
D. 0.43 ft

19. A gas at 20° C and standard pressure has a density of 2.80 gm/1. Pressure remaining constant, at what temperature will the density become 2.50 gm/1?

19.
A. 55.0° C
B. 22.4° C
C. 244° C
D. –29.0° C

20. Into two columns connected by a narrow tube are placed equal weights of the same liquid. One tube is kept at 0° C the other at 100° C. The length of the 0° C colmun is 70 cm high, the 100° C column is 74 cm. Find the coefficient of real expansion of the liquid.

20.
A. 0.00055/° C
B. 0.00057/° C
C. 0.00060/° C
D. 0.00062/° C

21. Two positive charges of 40 esu and 30 esu are 15 cm apart. A unit positive charge is placed 5 cm from the 30 esu charge, and between the two. The resultant force acting on the unit charge is

21.
A. 1.6 dynes toward +40
B. 5.3 dynes toward +30
C. 0.8 dynes toward +40
D. 4.1 dynes toward +40

22. The number of BTU's needed to change 4 lbs of ice at 0° F to 70° F is

22.
A. 536 BTU
B. 856 BTU
C. 198 BTU
D. 792 BTU

FOR ROUGH WORK ONLY

(No marks given for work in this space)

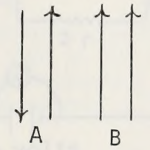
23. A glass globe contains air at 27° C and 1 atmosphere pressure. The maximum internal pressure the globe can witstand is 1.4 atmospheres. At what temperature will the glass burst?

23. A. 147° C
B. 420° C
C. 38° C
D. 133° C

24. A mixture is composed of 20 gm of metal of Sp. Ht. 0.2 cal/gm° C at 80° C, 10 gm of ice at 0° C and 50 gm of liquid of Sp. Ht. 0.6 cal/gm° C at 30° C. What is the resulting temperature assuming no heat loss to surroundings?

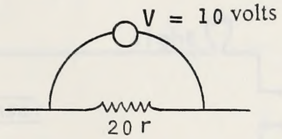
24. A. 11.5° C
B. 9.5° C
C. 13.5° C
D. 12.5° C

25. Two parallel wires carry current in the same direction as shown by B and opposite direction as shown by A. The two wires



25. A. show no effect in either A or B
B. will attract each other in B
C. will repel each other in A
D. will repel each other in B

26. The number of coulombs of charge flowing through the resistance in 1 minute is

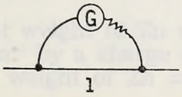


26. A. 30
B. 600
C. 120
D. ½

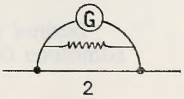
27. As a lead storage battery discharges the density of the electrolyte

27. A. undergoes no change
B. cannot be determined with given information
C. decreases
D. increases

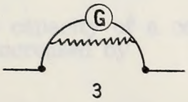
28. A galvonometer adapted as an ammeter is shown used in 4 days.



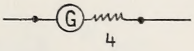
1



2



3



4

The correct use is illustrated by

28. A. 1
B. 2
C. 3
D. 4

FOR ROUGH WORK ONLY

(No marks given for work in this space)

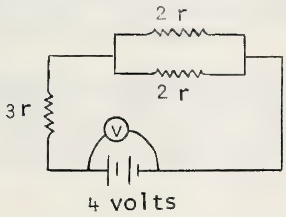
29. In a 100% efficient step-up transformer, the quantity which increases is

29. A. watts
B. horsepower
C. amps
D. volts

30. The heating element of a heater has a resistance of 100 ohms. The wire of the element has a resistivity of .01 ohm cm with a cross-sectional area of .01 cm^2. The length of the wire is

30. A. 10 cm
B. 100 cm
C. 1000 cm
D. 10,000 cm

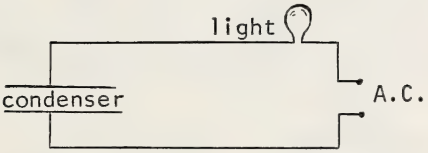
31. Each of the two cells has an emf of 2v and an internal resistance of 0.5 ohms. The terminal voltage reading v given by the voltmeter is



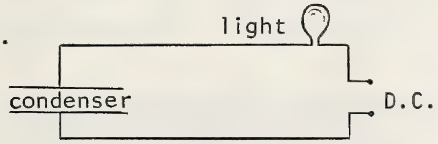
31. A. 4.0 v
B. 0.80 v
C. 3.2 v
D. 2.0 v

32. In the circuit diagram shown the light will go on in

A.



B.



32. A. A but not B
B. B but not A
C. neither A or B
D. both A and B

33. What weight of Zn will be ionized to Zn^{++} by a charge of 9650 coulombs (At. weight of Zn = 65)

33. A. 32.5 gm
B. 65 gm
C. 6.5 gm
D. 3.25 gm

34. The capacity of a condenser will not be increased by

34. A. increasing the size of collecting plate
B. increasing the "effective area" of condensing plate
C. using a vacuum as the dielectric in place of other material
D. reducing the distance between the plates

[OVER]

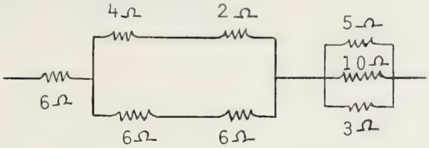
FOR ROUGH WORK ONLY

(No marks given for work in this space)

35. Three identical metal spheres A. B, C are charged +60 esu, –30 esu, +60 esu respectively. All three are made to mutually touch. The charge on A will be

35. A. +60 esu
B. +30 esu
C. +45 esu
D. +20 esu

36. The total resistance shown in the circuit is



36. A. 8 ohm
B. 11.6 ohm
C. 27 ohm
D. 66 ohm

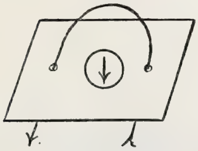
37. A current of 2.5 amps operating for 30 minutes liberated 1.5 gms of metal in a voltameter.. The electro-chemical equivalent of the metal is

37. A. 0.02
B. 0.00033
C. 0.00011
D. 0.0054

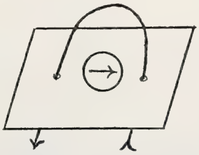
38. A magnetic compass placed inside a half-loop will turn in the direction shown by arrow indicating the direction of the current in the wire

38. A. 1
B. 2
C. 3
D. 4

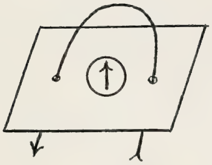
1



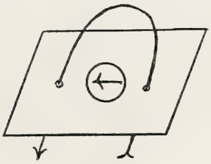
2



3



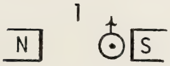
4



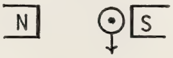
39. The diagrams represent a wire carrying a current in a magnetic field. The direction of the current is towards you. According to the LHR the direction of rotation is wrong in

39. A. 2, 3
B. 1, 4
C. 2, 4
D. 3, 4

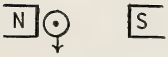
1



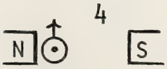
2



3



4



FOR ROUGH WORK ONLY

(No marks given for work in this space)

Values

The remaining questions are long answer questions. Complete solutions must be shown.

40. A body which weighs 20 lb wt falls to the earth and lands with a velocity of 40 ft/sec. Assuming that the body fell from rest find:

2 (a) the time it fell

2 (b) the distance it fell

2 (c) its potential energy when it was this distance from the ground. (use ft-lbs wt as the unit of energy)

2 (d) the Kinetic energy in ft lb wt units of the body as it strikes the ground.

FOR ROUGH WORK ONLY

(No marks given for work in this space)

Values

5 **41.** A certain volume of copper (S.G. of 8.9) is attached to a volume of 25 cc aluminum (S.G. of 2.7). It is found that the weight of the combined mass in water is 161 grams. Find the volume of the copper.

6 **42.** A 10 ft plank is raised so that one end is 6 ft from the horizontal. A block of wood weighing 30 lb wt slides down the plank. If the coefficient of friction is 0.25, find the acceleration of the block of wood.

FOR ROUGH WORK ONLY

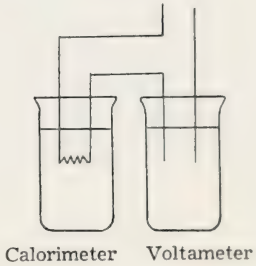
(No marks given for work in this space)

Values

5 **43.** A sled of mass 240 lb is pulled over snow whose temperature is 32° F, for a distance of 100 ft, the coefficient of sliding friction is 0.1. What is the total weight of snow that could be melted by the sled runners? (Heat of fusion of snow is 144 BTU/lb)

44. A heating coil of resistance 20 ohms is immersed in a calorimeter containing 1 Kgm of water at 15° C. In series with the calorimeter is a copper voltameter. After 30 minutes, the cathode in the voltameter showed a weight increase of 1.78 gms. (ECE of copper = 0.00033)

2 (a) Find the current flowing through the circuit.



4 (b) Assuming no heat loss, what will be the temperature of the water?

FOR ROUGH WORK ONLY

(No marks given for work in this space)

Values

45. A motor on a 110 v line using 10 amps of current lifts a weight of 5000 lb wt. at the rate of $\frac{1}{10}$ ft/sec.

2 (a) What is the input H.P. of the motor?

2 (b) What is the output H.P. of the motor?

2 (c) What is the efficiency of the motor?

DATE DUE SLIP

F255

LB 3054 C2 D419 1968A PHY-30
DEPARTMENTAL EXAMINATIONS GRADE
12 1968 AUGUST --

39780826 CURR HIST

000016283863

LB 3054 C2 D419 1968a phy.30
Departmental examinations,
[grade 12] 1968, August. -

39780826 CURR HIST